UNITED STATES DEPARTMENT OF AGRICULTURE
WAR FOOD ADMINISTRATION
Office of Marketing Services
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Methods for Operating the Brown-Duvel Moisture Tester for Determining the Moisture Content of Grain and Other Substances

(A summary of Department Bulletin No. 1375, issued February 1926; revised February 1936; mimeographed revisions June 1942 and August 1942)

Special Points to Be Observed in Making Moisture Tests:

(1) The moisture tester should be installed in a place where it will not be exposed to strong air current.

(2) The standard tester is equipped for heating with illuminating gas.

(3) The wire gauze with asbestos center should be kept in good condition, and so adjusted that the flame plays directly on the center of the abestos.

(4) The bottom of the flask should be not less than three-eighths inch above the wire gauze.

(5) The column of mercury in the thermometer should be continuous; if broken, it should be shaken down.

(6) The sample should be thoroughly mixed before weighing for tests; and unless the test is to be made immediately upon the sample's arrival in the office, it should be placed in an air-tight container.

(7) Tests should be made in duplicate, and if duplicates vary over 0.3 percent moisture, another test should be made.

(8) The thermometers should be so adjusted that four-fifths of the mercury bulb is submerged in the grain and oil after the grain has been placed in the flask. (See to the adjustment each time. Do not guess.)

(9) Correctly graduated thermometers and graduates should be used.

(10) Mushy rubber stoppers must not be used as they absorb some of the moisture that should pass into the graduates.

(11) Each graduate should be cleaned and dried before using for a test. (Do not let them show any moisture in the bottom or along the sides.)

(12) Oil should not be used directly from the previous test. Used flasks should be emptied into a large storage can and never directly into the oil-measuring device.

(13) A good circulation of cold water should be maintained through the condenser tank.

(14) The heating apparatus should be so adjusted that the required temperature is reached in 20 minutes. A longer time will give results too low and a shorter time, too high.

(15) If the moisture content of the sample is high so that there is a tendency to boil over, the flame should be lowered until a considerable portion of the water is distilled over.

(16) The heat should be cut off at the exact temperature prescribed for each grain.

(17) After the flame is extinguished, a slight gradual rise in the temperature is to be expected. A sudden increase or sudden decrease in temperature of several degrees indicates that the flame was too intense during the latter part of the heating, and the test should be repeated.

(18) Covers and thermometers should not be removed until the temperature recedes to 160° C.

(19) After the temperature has fallen to 160° C. or lower, the thermometer is disconnected and then the delivery tube.

(20) The percentage of moisture in the graduated cylinder should be read after all the drops clinging to the sides of the graduates have been shaken down. The reading is taken beneath the layer of oil on top of the water.

(21) Results of tests need not be expressed more closely than 0.1 percent.

(22) If the water which distills over is discolored, the substance has evidently been burned and the test should be repeated.

(23) When machine is not in use, thermometers should be kept connected in the flasks and the flasks connected with the distilling tubes in the same manner as for making a test.

(24) Before making a test in a new flask, or before using a machine that has not been in use for a 24-hour period, a test should be made on a preliminary sample so that all the flasks will be in uniform condition.

(25) Scales should be placed on a firm support and care should be taken that they are in balance before a weighing is made.

(26) The specific directions given above for making tests do not apply in all instances to modified forms of Brown-Duvel types of moisture testers.

Summary of Specifications for Testing Gram and Other Substances

Substance	Oil in flask: CC	Weight of grain in flask: Grams	Cut off the Heating element at-: °C.
Grains under the U. S. Grain Standards Act-			
Hard Red Winter, Hard Red Spring, Durum, Wheat; and Red Durum	150	100	180
Soft Red Winter and White	150	100	190
Corn (Maize-shelled)	150	100	190
Barley	150	100	190
Oats, Feed Oats, and Mixed Feed Oats	150	100	195
Rye	150	100	185
Grain Sorghums	150	100	195
Flaxseed	150	100	175
Soybeans: Effective Sept. 1, 1942 1/	150	100	173
Rice, Beans, and Peas, under permissive			
U. S. Standards-Head rice (milled) 2/....3	150	100	4/210
Second head rice 2/....3	150	100	4/210
Screenings rice 2/....3	150	100	4/210
Brewers rice 2/....5	150	100	200
Brown rice 2/....3	150	100	4/210
Rough rice 2/	150	100	4/210
Beans (dry) 1/	150	100	175
Dry peas 1/	150	100	175
Split peas (dry) 1/	150	100	175
Other substances-			
Buckwheat	150	100	195
Emmer	150	100	190
Peanuts (shelled)	150	100	175
Barley malt	200	100	168
Distillers dried grains	200	6/ 50	190
Corn meal 7/	150	6/ 50	8/175
Mustard Seed 1/	150	100	160
Corncobs	250	6/ 50	190

1/ Substance and method not listed in Department Bulletin No. 1375.

2/ In making tests of these classes of rice the distillate is sometimes cloudy. This in no way affects the accuracy of the test and may be disregarded.

3/ Use glass-wool pad 3 inches in diameter and $\frac{1}{4}$-inch thick in bottom of flask.

4/ Revised temperature cut-off.

5/ Use glass-wool pad 4 inches in diameter and $\frac{1}{4}$-inch thick in bottom of flask.

6/ Use special graduate which is one-half the volume of the regular graduate. However, the regular graduate may be used by doubling the moisture-test reading.

7/ Use double-wall copper flasks with 150 cubic centimeters of oil in the inner flask and 150 cubic centimeters between the walls.

8/ Oil and meal in inner flask should reach a temperature of 175°C. in about 26 minutes.

Oil Test for Standardizing Gas Flames

To standardize the heating time for making the moisture test proceed as follows: Place 450 cubic centimeters of oil (the regular moisture-testing oil) at room temperature into the flask of each compartment of the tester. This oil should be accurately measured. For each flask, insert the thermometer so that the mercury bulb is completely immersed and the top of the bulb is just flush with the surface of the oil, and note the temperature of the oil. Connect the flask with the condensing tube, replace the cover, light the gas, and note the time. Apply heat until the temperature of the oil reaches 153°C. above the original temperature of the oil, and again note time. The time elapsed should be 20 minutes. If more than 20 minutes is required to reach 153°C. above the original temperature of the oil, the hole in the base of the burner should be slightly opened; if less than 20 minutes, the hole should be closed somewhat. The hole may be closed by lightly tapping the top of the base with a small hammer or any blunt instrument. It may be opened with a suitable reaming tool, such as a fine brooch, used by jewelers. Similar trial tests should be made for each compartment until the required time for heating all compartments does not vary more than one-half minute from 20 minutes; that is, not less than 19½ minutes or more than 20½ minutes, should be necessary to raise the temperature of the 450 cubic centimeters of oil 153°C. above the original temperature of the oil.

The only way in which this check test differs from the making of an ordinary moisture test is that 450 cubic centimeters of oil are used instead of 150 cubic centimeters, and that the thermometer is adjusted so that the top of the mercury bulb is just flush with the surface of the oil rather than four-fifths immersed.

If an automatic gas-pressure regulator is used, and the correct heating time for each burner has been adjusted, as described on page 22 of Department Bulletin No. 1375, a uniform heating time for all compartments is assured. If, however, a gas governor is not available, it will be necessary for the operator to decide how much flame is necessary to heat the tester in the proper time, and, in case the gas pressure varies, to compensate for this by adjusting the keys and air valves at the base of the burner.

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